

Appn. No. 09/544,742
Response E dated December 3, 2003
Reply to Office Action of 09/16/2003

REMARKS/ARGUMENTS

A. Concerning the Amendments

Claim 1 is amended to limit the catalyst to a "hydro-oxidation" catalyst composition. The meaning of the term "hydro-oxidation" is found at pages 1, 2, 4, 18-21, of Applicants' specification. Moreover, the specification illustrates hydro-oxidation catalysts and hydro-oxidation processes in all of the Examples. Further, Applicants have discussed the concept of "hydro-oxidation" in all previous responses filed in this application, as well as at the Examiner's Interview Meeting held on May 5, 2003, in Arlington, Virginia. This amendment also strengthens a previous amendment to Claim 1, which incorporated an intended use of the catalyst in a hydro-oxidation process. Accordingly, the present amendment does not raise new issues and is deemed to be proper.

Claim 10 is rewritten in independent form, per the Examiner's instruction that rewriting in such form would render the claim allowable.

Claim 16 is amended to correct an inadvertent error in antecedent basis. The word "a" is deleted and replaced with the word "the."

Claims 19 and 21 are amended to depend from Claim 10.

New Claims 38 to 46 are presented copying claims already examined in the application, with the exception that the new claims depend from Claim 10 rather than Claim 1. Since Claim 10 is held to comprise allowable subject matter, then new Claims 38 to 46 should also be allowable. No new matters or issues are raised in the submission of these new claims. Nevertheless, support for the new claims is presented for the record.

More specifically, new Claim 38 copies Claim 2, excepting that new Claim 38 depends from Claim 10. Support for new Claim 38 is found at page 7, lines 23-29, of the specification.

New Claim 39 copies Claim 3, excepting that new Claim 39 depends from Claim 10. Support for new Claim 39 is found at page 7, lines 1-5, of the specification.

New Claim 40 copies and combines Claims 22 and 23, excepting that new Claim 40 depends from Claim 10. Support for new Claim 40 is found at page 15, lines 25-26, and at page 16, lines 1-6, of the specification.

New Claim 41 copies Claim 24, excepting that new Claim 41 depends from Claim 10. Support for new Claim 41 is found at page 16, lines 12-16, of the specification.

Appln. No. 09/544,742
Response E dated December 3, 2003
Reply to Office Action of 09/16/2003

New Claim 42 copies and combines Claims 25 and 26, excepting that new Claim 42 depends from Claim 10. Support for new Claim 42 is found at page 10, lines 1-8, and at page 17, line 22, of the specification.

New Claim 43 copies Claim 27, excepting that new Claim 43 depends from Claim 42. Support for new Claim 43 is found at page 17, lines 30-32, of the specification.

New Claim 44 copies Claim 28, excepting that new Claim 44 depends from Claim 10. Support for new Claim 44 is found at page 7, lines 12-16, of the specification.

New Claim 45 copies Claim 29, with the exception that new Claim 45 depends from Claim 10. Support for new Claim 45 is found at page 7, lines 16-18, of the specification.

New Claim 46 copies Claim 30 in combination with Claim 32, with the exception that new Claim 46 depends from Claim 10. Support for new Claim 46 is found at page 17, lines 30-37, and at page 18, lines 1-8, of the specification.

Again, since Claim 10 has been held to be allowable, then new Claims 38 to 46 should also be allowable. No new matter is introduced with these new claims, because the claims are supported in the specification and, with exception of their dependency, are copies of previously examined claims.

B. Concerning the Rejection of Claims 1-7, 9, 18, 22-27, 29-33, and 37 Under 35 U.S.C. 102(b)

Claims 1-7, 9, 18, 22-27, 29-33, and 37 stand finally rejected under 37 C.F.R. 35 U.S.C. 102(b) as allegedly being anticipated by Iwakura et al. (US 5,502,020) for the reasons of record. This Final Rejection, as it might apply to amended Claims 1-7, 9, 18, 22-27, 29-33, and 37, is traversed for the following reasons.

Iwakura et al. discloses preparing a catalyst for the oxidation of ethylene with oxygen to form ethylene oxide. The catalyst is taught to contain silver, tungsten, cesium, and optionally one or more elements selected from a list of about 41 elements, including gold. Impregnation of the metals onto a support is disclosed, including any of five supports including titania. Ethanol and water are disclosed as solvents for dissolving the silver compound. Iwakura et al. is silent with respect to preparing a hydro-oxidation catalyst and the presence of hydrogen in the oxidation process.

In contrast, Claim 1, as amended in its preamble, is drawn to a method of preparing a hydro-oxidation catalyst for use in an oxidation process with oxygen in the presence of hydrogen (hydro-oxidation). Applicants' amendment goes beyond a statement of intended

Appln. No. 09/544,742
Response E dated December 3, 2003
Reply to Office Action of 09/16/2003

use to concretely identify the catalyst as a "hydro-oxidation catalyst." As evidenced in the art (*vide infra*) and at pages 1, 2, 4, 18-21, and the Examples in Applicants' specification, the term "hydro-oxidation" refers to an oxidation process of contacting an organic compound, such as an olefin, with oxygen in the presence of hydrogen to prepare typically one or more partially-oxidized organic compounds, such as olefin oxides. In general, a preamble, limits the [claimed] invention if it recites essential structure or steps, or if it is 'necessary to give life, meaning, and vitality' to the claims. *Eaton Corp. v. Rockwell International Corp.*, 66 USPQ 2d, 1276, 1282 (Fed. Cir. 2003), (quoting *Pitney Bowes, Inc. v. Hewlett Packard Co.*, 182 F.3d 1298, 1305, 51 USPQ2d 1161, 1165 (Fed. Cir. 1999)). [A] claim preamble has the import that the claim as a whole suggests for it. In other words, when the claim drafter chooses to use *both* the preamble and the body to define the subject matter of the claimed invention, the invention so defined, and not some other, is the one the patent protects." *Bell Communications Research, Inc. v. Vitalink Communications Corp.*, 55 F3d. 615, 620, 34 USPQ2d 1816, 1820 (Fed. Cir. 1995).

The claimed process of preparing a hydro-oxidation catalyst comprises impregnating a gold compound and a reducing agent onto a support, the reducing agent comprising titanium, or the support comprising titanium, or both the reducing agent and support comprising titanium, under conditions sufficient to prepare the hydro-oxidation catalyst. Insofar as Iwakura et al. does not teach or suggest a titanium-containing reducing agent, Claim 1 is novel over Iwakura et al. The following discussion pertains to the alternative, wherein the support contains titanium and the reducing agent is an organic compound that does not contain titanium, such as an alcohol (e.g., ethanol).

The Office Action errs by citing Iwakura et al., which clearly pertains to the preparation of a direct oxidation catalyst, that is, a catalyst for the oxidation of an organic compound (e.g., ethylene) with oxygen or air. In contrast, Claim 1, now amended in its preamble, requires preparation of a "hydro-oxidation catalyst," which provides for oxidation in the presence of oxygen and hydrogen. The Office Action is fatally flawed by disregarding the distinctions between direct oxidation and hydro-oxidation catalysts.

The Examiner argues that since hydrogen is present in air, a catalyst for direct oxidation with air or oxygen is effectively not distinguished from a hydro-oxidation catalyst. On the contrary, an ordinary person skilled in the art understands that the minuscule quantity of hydrogen present in air (*0.5 parts per million*) essentially cannot effect a hydro-oxidation process. The ordinary person skilled in the art knows that such tiny traces of hydrogen have negligible effect on direct air oxidations, else commercially practiced air oxidations would

Appln. No. 09/544,742
Response E dated December 3, 2003
Reply to Office Action of 09/16/2003

have different processing constraints and different results. The skilled artisan knows that hydro-oxidation processes require an effective amount of hydrogen, typically, *200 to 2,000 times greater than in air*. Overwhelming evidence in the patent art supports the distinctions between direct oxidation and hydro-oxidation catalysts and processes. Refer to US 4,007,135 and US 4,242,235 for a description of direct oxidation, known for many decades. In contrast, refer to WO 96/02323 and WO 98/00414 for a description of hydro-oxidation, discovered and developed since 1996. (Copies of record.)

The Examiner argues that the claims must be given their broadest interpretation, since limitations such as "0. 5 parts per million hydrogen" or "hydrogen as a material element" are not present in the recited claims. The Examiner errs, because the amended claims clearly identify and limit the catalyst to a "hydro-oxidation catalyst." By virtue of its inherent definition and meaning, "hydro-oxidation" requires an oxidation to take place each and every time in the presence of an effective amount of hydrogen, else the oxidation is not a hydro-oxidation. Accordingly, the limitation to an effective or material amount of hydrogen inherently exists in the amended claims in the limitation to "hydro-oxidation" catalysts.

The Examiner argues that "If the prior art structure is capable of performing the intended use, then it meets the claim." Iwakura et al. unambiguously teaches making a direct oxidation catalyst for use with air. The reference is completely silent with regard to hydrogen, an effective amount of hydrogen, and hydro-oxidation. Silence is never a proper substitute for a clear disclosure of facts. Furthermore, Iwakura et al. discloses all of at least 41 subsidiary metals as equivalent species; yet one skilled in the art might expect that some of Iwakura's disclosed metals may be potentially useful (e.g., Au) and some are likely to be detrimental (e.g., W, Nb) in a hydro-oxidation process. Accordingly, one skilled in the art would not know and might not expect each and every structure of Iwakura et al. to be capable of performing the intended use. Consequently, it cannot be maintained that Iwakura et al. explicitly or inherently teaches a method of making a hydro-oxidation catalyst. Inherency may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. *SGS-Thomson Microelectronics, Inc. v. International Rectifier Corp.*, 32 USPQ 2d 1496, 1503 (Fed. Cir.)

The Examiner argues that "In a claim drawn to a method of making, the intended use must result in a manipulative difference as compared to the prior art." The outcome of Applicants' claimed method clearly results in a manipulative difference over the prior art. Hydro-oxidation catalysts catalyze more reaction pathways (e.g., hydrogenation of olefins and combustion of hydrogen to water, besides oxidation of the organic) and exhibit different

Appln. No. 09/544,742
Response E dated December 3, 2003
Reply to Office Action of 09/16/2003

selectivities (e.g., higher selectivities to olefin oxidants), as compared with direct oxidation catalysts. The differences between the aforementioned catalysts are typically illustrated in the art with C3 and higher hydrocarbons rather than ethylene; therefore, the ethylene oxidation described in Iwakura et al. does not imply certain hydro-oxidation capability, but only sheds light on the disclosed direct oxidation process.

The undersigned repeatedly emphasized the technical differences between hydro-oxidation and direct oxidation catalysts in her meeting with the Examiner in Arlington, Virginia, on May 5, 2003, and in Applicants' Response D (pages 6-7), filed on August 6, 2003. No repetition of recognized scientific facts should be needed here.

Further, the claimed "method of making" unequivocally requires manipulative selections over the prior art. Iwakura et al. discloses all subsidiary elements from Groups IB, IIB, IIIB, IVA, IVB, VB, and VIA and tellurium as equivalent species. The catalyst supports comprising alumina, silicon carbide, titania, zirconia, and magnesia are taught to be equivalent species. Water and alcohols are disclosed as equivalent solvents. No markers or trail blazers whatsoever, no suggestions or even hints, are provided by Iwakura et al. to illuminate what combination of these many disclosed components should be selected and manipulated to make an active hydro-oxidation catalyst. In contrast, from this forest of details, Applicants select gold, select a titanium-containing support, and conceive of an organic reducing agent, which may be selectively alcohol, but *not* water, for preparing a hydro-oxidation catalyst. The number of selections taken from the diverse teachings of Iwakura et al. precludes a finding of anticipation.

Finally, the Office Action emphasizes that little credence is given to the intended use limitation. In response, Applicants have amended their claims to identify the prepared catalyst as a "hydro-oxidation catalyst," which amendment goes beyond intended use to a clearly defined limitation in the catalyst prepared, and by so doing, brings life, vitality, and meaning to the claims. When a preamble gives life and meaning to the claim, it is treated as a limitation and is not merely a statement of effect that may or may not be desired or appreciated. Instead, it is a statement of the intentional purpose for which the method must be performed. *Janson v. Rexall Sundown, Inc.*, 03-1069, 2003 U.S. app. LEXIS 18478 (Fed. Cir. 2003).

In view of all of the above, amended Claims 1-9, 18, 22-27, 29-33, and 37 clearly meet the standards for novelty over Iwakura et al. It is respectfully requested that the Final Rejection under 35 U.S.C. 102(b) over Iwakura et al. be withdrawn

Appl. No. 09/544,742
Response E dated December 3, 2003
Reply to Office Action of 09/16/2003

C. Concerning the Rejection Under 35 U.S.C. 102(b) in View of Rajaram et al.

Claims 1, 4-5, 18, 22-23, 26-28, and 20-32 [sic: 29-32?] stand finally rejected as allegedly being anticipated by Rajaram et al. (US 5,480,854), for the reasons of record. This Final Rejection, as it may apply to amended Claims 1, 4-5, 18, 22-23, 26-28, and 29-32, is traversed for the following reasons.

The Final Rejection errs by citing Rajaram et al., which relates to preparing a catalyst for exhaust engines for complete combustion of carbon monoxide to carbon dioxide. In contrast, by amendment to the preamble of Claim 1 herein, Applicants claim a process for preparing a "hydro-oxidation catalyst." Again, the amendment is intended to bring life, vitality, and meaning to the claims. The catalyst art clearly distinguishes between a combustion catalyst, operating with air for the complete combustion of hydrocarbons to carbon dioxide and water, and a hydro-oxidation catalyst, operating with oxygen in the presence of an effective amount of hydrogen for the purpose of preparing partially-oxidized hydrocarbons, such as olefin oxides. Accordingly, Rajaram et al. cannot anticipate a method of making a hydro-oxidation catalyst.

More to the point, Rajaram et al. at Claim 2, and at Columns 5 and 6, teaches a catalyst prepared by co-precipitation to form a support having noble metals incorporated therein. Co-precipitation, which requires adding one solution to another solution to cause one or more precipitates to form, is a distinctly different technique from the claimed impregnation technique. By contrast, impregnation requires adding one or more solutions containing dissolved compounds directly onto a solid support. See Response D, filed August 6, 2003, which established the art-recognized distinctions between co-precipitation and impregnation.

Insofar as Rajaram et al. does not teach or suggest a titanium-containing reducing agent, Claim 1 is further distinguished over Rajaram et al. The following discussion pertains then to the alternative of Claim 1, wherein the support contains titanium and the reducing agent does not contain titanium, i.e., is an organic reducing agent.

Pointing to Example 2 of Rajaram et al, the Examiner argues, "Both impregnation and co-precipitation are disclosed.... Since both methods are disclosed, a claim to either reads upon the disclosure of the prior art." Admittedly, Example 2 discloses impregnation; however, the Examiner has taken teachings to impregnation totally out of context and pasted them into the context of reducing agents for the purpose of prejudicing the claims. A fair reading of Rajaram et al. shows that no nexus is ever made between impregnation and

Appln. No. 09/544,742
Response E dated December 3, 2003
Reply to Office Action of 09/16/2003

reducing agents. Rather, Rajaram et al. teaches use of a reducing agent to prepare a noble metal colloid for use in *co-precipitating* the noble metal with the support. (Rajaram et al., Col. 5, lines 63-67, continuing onto Col. 6, lines 1-5) Rajaram et al. also teaches use of a reducing agent to *precipitate* a secondary metal oxide with the noble metal and support. (Rajaram et al., Col. 6, lines 39-44) In fact, through all of Rajaram et al., reducing agents are used in connection with co-precipitation methods, and impregnation is mentioned as an alternative technique of lesser value and never in the context of impregnating a reducing agent.

In actuality, Example 2 illustrates a comparative experiment wherein chloroplatinic acid is impregnated onto ceria, with no mention of reducing agent. Significantly, the impregnated catalyst shows zero activity for oxidation or reduction. Clearly, the prior art does not meet the intended use of hydro-oxidation and therefore does not disclose the claims.

Furthermore, Rajaram et al. discloses noble metals of platinum, palladium, rhodium, and gold in equivalent capacity. Rajaram et al. discloses CeO₂, ZrO₂, TiO₂, SnO₂ as supports in equivalent capacity. To arrive at the invention from Rajaram et al., a skilled artisan would have had to select gold, to select a support containing titanium, to select impregnation over the preferred co-precipitation technique (moreover, despite negative results illustrated for impregnated materials), to select an organic reducing agent to be used in conjunction with impregnation, all for the purpose of preparing a hydro-oxidation catalyst, not an exhaust engine combustion catalyst. Since there are no trail-blazers or markers, no suggestions or hints whatsoever, to make the claimed selections for the explicit purpose of preparing a hydro-oxidation catalyst, Rajaram et al. does not anticipate the claims. Moreover, the manipulative selections made by Applicants result in a manipulative distinction over the prior art. Whereas the prior art results in a catalyst with selectivity to total combustion products (CO₂ and H₂O) or no activity at all, the claimed process as illustrated in Applicants' Examples results in a hydro-oxidation catalyst having high selectivity to partially-oxidized products, i.e., olefin oxides.

In view of the above, amended Claims 1, 4-5, 18, 22-23, 26-28, and 20-32 [sic: 29-32] are not anticipated by Rajaram et al. It is therefore respectfully requested that the Final Rejection under 35 U.S.C. 102(b) in view of Rajaram et al. be withdrawn.

Appn. No. 09/544,742
Response E dated December 3, 2003
Reply to Office Action of 09/16/2003

D. Concerning the Rejection of Claims 1-7, 9, 18, 22-23, 25-29, and 31-32 under 35 U.S.C. 102(b) as Anticipated by Haruta et al. (US 4,937,219)

Claims 1-7, 9, 18, 22-23, 25-29, and 31-32 stand finally rejected under 35 U.S.C. 102(b) as anticipated by Haruta et al. (US 4,937,219), for the reasons of record. This Final Rejection, as it might apply to amended Claims 1-7, 9, 18, 22-23, 25-29, and 31-32 is traversed for the following reasons.

Insofar as Haruta et al. does not teach or suggest a titanium-containing reducing agent, the claims are distinguished over Haruta et al. The following discussion pertains to the alternative, wherein the support contains titanium and the reducing agent does not contain titanium, as in an organic reducing agent.

The Examiner argues that "[S]ince Example 12 discloses the claimed invention, the claim is anticipated." Unfortunately, the Examiner persists in misunderstanding the technical details of Example 12 to arrive at an incorrect conclusion that prejudices the claims. Example 12 does *not* disclose, suggest, or hint at impregnation of gold and a reducing agent, as Applicants' claim. Rather, Haruta et al. discloses *a variety of precipitation methods* employing an organic reducing agent (e.g., formalin) to deposit gold particles onto an alkaline earth support, optionally containing other composite oxides, including titanium oxides. With reference to Example 12:

(a) *An aqueous solution of magnesium nitrate is impregnated onto a honeycomb support.* Neither gold nor reducing agent is disclosed in this step, which is therefore not relevant to the claims.

(b) *The honeycomb is immersed in a solution (1 liter) of chloroauric acid; pH is adjusted; and then an aqueous solution (500 ml) of magnesium citrate is added dropwise with stirring for one hour.* The Examiner argues that the "immersion" of the support into the solutions constitutes impregnation. Again, the Examiner focuses on one manipulation —the immersion—, taken incorrectly and out of context, in an attempt to prejudice the claims. The Examiner's approach is impermissible; the disclosure in its entirety must be considered. Moreover, the Examiner is again directed to publications, of record in this file, that distinguish impregnation from precipitation.

A skilled artisan would recognize that the complete manipulation disclosed by Haruta et al. pertains to a *precipitation* method, not impregnation. Firstly, the large volume of

Appn. No. 09/544,742
Response E dated December 3, 2003
Reply to Office Action of 09/16/2003

liquids taught (1500 ml) could not be substantially absorbed into the honeycomb. To this point, the reference actually teaches that the honeycomb is later "separated from the aqueous solution." (Haruta et al., Column 16, lines 19-20) In contrast, impregnation employs absorption of substantially all of the liquid onto and into the support. Impregnation typically does not use large volumes of liquid. Secondly, precipitation requires that one solution is added to a second solution, typically at controlled pH, slowly and with stirring, to cause a precipitate to form and deposit. That manipulation is *exactly* the manipulation Haruta et al. discloses, to cause reduced gold particles to deposit on the support. In contrast, impregnation simply involves one or more solutions being added to and absorbed directly onto a support. In impregnation, no solutions are added to each other to cause precipitation. In impregnation, typically, large volumes are not needed; pH need not be controlled; and the time factor need not be slow. In view of the above, Example 12 clearly relates to precipitation, which is consistent with the entire disclosure of Haruta et al.

With reference to Claim 28, the immersion disclosed by Haruta et al., of the honeycomb in 1500 ml of liquid, *cannot* comprise an impregnation to "incipient wetness." The latter requires wetting the solids only to the point of "beginning wetness," which is obviously not achieved by the disclosed immersion and later separation.

In view of the above, amended Claims 1-7, 9, 18, 22-23, 25-29, and 31-32 meet the requirements of 35 U.S.C. 102(b). It is therefore requested that the Final Rejection under 35 U.S.C. 102(b) over Haruta et al. be withdrawn.

E. Conclusions

The Examiner is reminded that chemistry is essentially an experimental science and results are often uncertain, unpredictable, and unexpected. Catalytic effects are a particularly unpredictable aspect of the art of chemistry. *Corona Co. v. Dovan Corp.*, 276 U.S. 358 (1928); *In re Downani*, 47 CCPA 1120, 281 F.2d 215, 126 USPQ 408 (1960). Consequently, references teaching to the preparation of catalysts other than hydro-oxidation catalysts cannot anticipate the claimed method of preparing a hydro-oxidation catalyst.

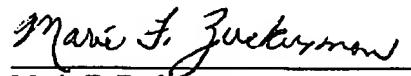
The Examiner is further reminded of EP-A1-0,709,360 (copy of record), which discloses a method of preparing a hydro-oxidation catalyst by impregnating a gold compound onto a titanium-containing support. No reducing agent is mentioned or illustrated. The reference teaches that "absolutely no catalytic activity is found." Consequently, Applicants' recognition of the criticality of impregnating gold *and* impregnating a reducing agent onto a

Appln. No. 09/544,742
Response E dated December 3, 2003
Reply to Office Action of 09/16/2003

support for the purposes of preparing an active and selective hydro-oxidation catalyst speaks for the novelty and non-obviousness of the claims.

In view of the amendments and arguments presented hereinabove, Applicants submit that amended Claims 1-32 and 37, and new Claims 38-46 depending from amended Claim 10, meet all of the criteria for patentability. It is respectfully requested that the Final Rejection be withdrawn and that a Notice of Allowance be issued at the Examiner's earliest convenience.

Respectfully submitted,



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Date: December 3, 2003

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